

SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

BIRMINGHAM AND THE BLACK COUNTRY—No. XIV.
IMPROVEMENTS IN THE MANUFACTURE OF IRON.

Throughout this series of articles we have repeatedly noticed, with regret, the backward state of South Staffordshire as an iron-producing district, and the great antipathy of the ironmasters to improvements. It is stated that other people may experiment, and try the new modes of manufacture, while the Black Country ironmasters look on, and profit by the results. This is partly true, but not entirely so, for they fail to profit by the results of others' labours, and when they see great benefit derived from bold enterprise then even hesitate to adopt the means; preferring to go on in the old style rather than take the trouble and go to the expense of making any change, although to their own advantage. Many object to any improvement merely from prejudice, and refuse to believe in things that are carried out with success before their own eyes. No one but those engaged in the iron trade of this district can imagine the amount and strength of this ridiculous prejudice. We would have Staffordshire where she ought to be—in the front. It is well known that with her rich minerals the very best iron can be made, and whilst these last why can she not command the cream of the trade? That she is far behind her competitors needs no proof from us; a walk has only to be taken through even the most modern of the works, and it will be observed that very little advance has been made for many years past, although the other districts are making rapid strides.

We will here give particulars of a process that, we think, would yield a large harvest to any person adopting it; and having studied its merits and demerits, we have no hesitation in saying that it is a great improvement in the manufacture of iron, and one that could not only be worked to great profit, but would better any district in which it was carried out to perfection. The process is the patented invention of Mr. Vaughan Pendred, C.E., M.S.E., &c., of Crohill House, Dulwich, near London, and Mr. Harris, now manager of the Ashton Ironworks, near Bristol; the former an engineer of no small repute, and the latter a mill and forge manager of some 20 years experience in the largest establishments in the kingdom. The object of the process is to produce perfectly homogeneous rails, bars, and plates, at a less cost than the ordinary bars, rails, and plates, which are not homogeneous but laminated. It is unnecessary here to argue as to the objection to a laminar structure in finished iron; every engineer and user of this substance is aware of the defect, and by the present mode of manufacture it cannot be dispensed with, especially when the article produced is of any size. Take, for instance, a rail; there is no one connected with railways, or who at any time walks along them, but has seen the tops of the rails when a little worn splitting and healing off at the sides, shortly becoming useless. It is an acknowledged fact that the superiority of the Bessemer rail is not so much due to its hardness as to homogeneity and freedom from the defect we have mentioned. We will not dispute the opinion of most ironmasters, that for certain descriptions of iron peculiar piling must be resorted to; but yet for by far the greater quantity of merchant iron it must be acknowledged that a well manipulated homogeneous structure would be preferable. To show that this result cannot be obtained by the present system, a brief description will suffice. The puddling furnaces are charged with about 4 cwt. of pig-iron. The iron is then puddled—the process of which we have described in a former article—and brought to nature, when it is divided into four balls, or more. These are taken out one by one, and brought to a steam or helve hammer, where they are shingled. The shingled balls are then passed through the forge trains of rolls, and rolled into puddled bars. The bars are cut up by the shears, and taken to the mills, where they are piled, placed in the re-heating furnaces, and afterwards rolled into shapes which constitute the elements of all wrought-iron articles, from the thinnest wire to the largest ship or bridge. No ordinary puddled bar weighs above 120 lbs., and they often do not exceed 70 lbs. or 80 lbs. The consequence is that any iron construction weighing more than 120 lbs. must be made up by welding two or more puddled balls or bars together, and by this means a condition is introduced which renders the attainment of homogeneity impossible. All welding is at present effected in the presence of free oxygen in the atmosphere, and the result naturally is that the surfaces to be welded are covered with a scale or cinder of oxide of iron, and without this is entirely excluded, and the two clean surfaces of the iron at a proper state of heat are brought together, not even perfect welding can be accomplished, leaving out of the question uniform texture and homogeneity, which cannot be attained; but as a direct result we have laminar structure. To form large masses of iron two methods are resorted to; it is either done by hammering two or more puddled balls together under a steam-hammer, thus making a large bloom, or by piling and uniting the bars constituting the pile under the mill rolls. Several trials have been made to hammer puddled balls together, and to some extent homogeneity of structure has been obtained, but it has been found impossible by this means to produce the same result with uniformity. This may be easily understood, as the process consists of bringing a puddled ball to the steam-hammer, knocking it flat, placing a second on top of it, and hammering the two together; the process may be continued by adding in the same manner any number of balls. Now, it is known that in the puddling-furnace a quantity of the iron is oxidised while the carbon is being burnt out; and as the pieces of iron produced have to be collected into balls it is necessary that they should not be covered with an almost infusible oxide, which would prevent their being brought into metallic contact, so that they could not be welded. It is, therefore, sought to produce in the puddling-furnace a welding cinder, and this is accomplished by the silica supplied by the sand sticking to the surface of the pig-iron, by the materials forming the bed of the furnace, and by the oxidation of the silicon contained in the pig-iron, which combines readily with the protoxide of iron, and forms easily fusible silicates, which may cover the surfaces of two pieces of iron, having no action upon them at a high temperature, but protecting them from oxidation and keeping them bright, so that when the two pieces of iron are brought together under pressure the liquid cinder is sent out and the bright surfaces unite. This welding cinder is a tribasic silicate of protoxide of iron, and not only acts in the furnace, but when the puddled ball is withdrawn and taken to the hammer; for if expedition is used the cin-

der remains in a fluid state, protects the iron from the atmosphere, and assists the welding in the way we have mentioned. Now, where the balls are to be agglomerated together the first is hammered flat on a horizontal surface, and the cinder in the iron, instead of being thoroughly ejected, to a certain extent remains, and may be seen bubbling on the surface of the iron which has been hammered and is to receive the second ball; but at this point it is not in the same state as when it left the furnace, and does not act in the same way; for when the second ball is placed on the first, instead of assisting the welding it prevents it, and is retained in the iron. It has been tried to remove the cinder upon the hammered surface by means of water and brushing, but here again a hard skin is formed, which is almost as bad as the cinder. It is, then, evident that homogeneity cannot be uniformly obtained with any certainty by this process.

In the piling of puddled bars, heating them in the re-heating furnaces, and passing them through the mill rolls, it is hardly necessary to state that homogeneity cannot be obtained; indeed, it is sometimes impossible to obtain even imperfect welding. In large piles it is a difficult matter to bring the whole of the surfaces to a welding heat, for by the time the centre portion of the pile is brought to the necessary state the outside may be burning. By what means, then, are we to get a homogeneous mass of iron that will be fitted for large plates, bars, or rails? We have no doubt but that it can be done by the patent process we will now describe. With this process it is not intended to interfere with either puddling or the use of the steam-hammer, but it is intended to come in between the two, and perform a part that will be equivalent to bringing the whole charge of a puddling furnace in one mass to the steam-hammer. The process consists in welding, or agglomerating, four, five, or six puddled balls into one, not in the open air under a vertical steam-hammer, but inside a suitable furnace, by the aid of a horizontal steam-hammer. The plant consists of a furnace, similar in some respects to an ordinary re-heating furnace, having two doors in the sides, one opposite to the other, and another, through which the charging is done, in the end furthest from the fire-grate. The products of combustion escape through flues, placed one on each side of the charging door. On one side of the furnace is fixed a horizontal steam-hammer, the top of which can pass through the opening in the side of the furnace, and be withdrawn at pleasure. Opposite the steam-hammer there is an anvil, formed as the ram of an hydraulic press, and placed horizontally. It is fitted with a piston, and on water under pressure being introduced, through a suitable valve, the ram or anvil is made to advance through the opening as far as the centre of the furnace, or to recede, so that the united balls may be pushed out through the opening into the furnace on to a trolley, by the hammer.

The full detail of the plant is not given, as it is not yet quite decided as to the exact arrangement of the machinery, but the principle is correct, and will be readily understood. To make the process quite clear we will briefly describe the manufacture of a rail. Should a rail be required weighing 600 lbs. finished, then a suitable quantity and quality of pig-iron would be put in two puddling-furnaces. No. 1 furnace will be charged first, and ten minutes after No. 2 furnace would be charged. The heat in No. 1 is ready first; a ball is drawn and taken to the welding-furnace, where it is rolled off the trolley through the charging place, over which the door is let down, and the openings in the sides of the furnace are at the same time covered by their respective doors, so that the furnace is filled by a reducing or deoxidising flame; the cinder on the iron is kept in a fluid state, and is in the same condition as when in the puddling-furnace. The balls are taken from No. 1 furnace one by one till the whole heat is placed in the welding-furnace. The attendant then introduces a hook through the hole in the front of the furnace, and brings a ball in a line with the hammer and anvil; the side doors are raised, the anvil is sent in by one attendant, while another sets in motion the steam-hammer. The ball is against the anvil, and receives a few light taps; the iron is soft, the furnace hot, the flame playing round the ball, no oxidation taking place, the surfaces to be welded are vertical, consequently the cinder flows out as water from a sponge, and trickles from the ball in all directions. A second ball is brought in contact with the first, and hammered to it, and so on till the contents of the two puddling-furnaces are welded into a single bloom about 7 cwt. in weight. As the balls are added one to the other the anvil is gradually withdrawn to make room for them. The balls are perfectly united, and form one enormous puddled ball, differing only from ordinary ones in that it is more consolidated, and far freer from cinder, which has been expelled, not round the forge, to the annoyance of the men, but within the furnace, where being still fluid it runs off through a tap-hole into the cinder wagon.

There is now in the furnace a large bloom, partly hammered, but yet as hot as when it left the puddling-furnace. This bloom is ready for further manipulation; the anvil is, therefore, withdrawn, and the bloom is pushed by the hammer out of the furnace on to a trolley, upon which it is taken to a heavy steam-hammer of the ordinary type, and by successive blows is made into a shape, about 7 or 8 in. square. From the hammer it is conveyed to the rail mill, passed through the blooming rolls, and made the required size for the finishing rolls. It is then re-heated, and rolled into a rail without weld, and very free from cinder. This process is very simple and inexpensive when compared with those carried out in the largest ironworks of Wales, where they can make the cheapest rails. One method there is to take the puddled balls, roll them into bars, let them cool, and after they are cut up and piled roll them into tops and bottoms. These are again cooled, piled with common puddled bars in the middle, re-heated, and rolled into rails. Here nearly 2 tons of coal per ton of rails produced has been used in the puddling and re-heating furnaces, and in the cropping and re-heating a loss of, perhaps, 15 per cent. of iron has been sustained.

Another plan is to take the balls from each puddling-furnace, and under a steam-hammer knock them into a bloom, which has to be again heated and shingled before it is rolled into bars. The bars are cut up, taken to the rail-mill, piled with common iron, or rail-croppings between them, re-heated, and rolled into rails. Nearly 2½ tons of coal per ton of iron has been used, and a large quantity of iron wasted. The contrast between the new process and the simplest now adopted will be clearly seen, and by it a better rail than with either of the others, can be produced at a much lower price. The machinery is light and inexpensive (with the exception of the ordinary steam-hammer, but this will now be found in use at most of the large ironworks), as the iron is in a pasty state, and needs but light treatment in the welding-furnace. Beside the great saving in

labour and fuel, the forge-train, cutting down shears, and machinery driving them, are dispensed with. One welding plant will answer for 15 or 20 puddling-furnaces. We have shown the operation of the process upon rails, but it would answer quite as effectually for any other description of iron. The iron produced is necessarily good, for it receives plenty of hammering, which lessens and unites the particles, and these in the final rolling are drawn out into a silken fibre.

OUR COAL SUPPLY.

SIR,—We were surprised to read in last week's Journal remarks in your leading article under the above head relative to the joint-stock company formed for the purpose of proving the mines under part of the estate belonging to Lord Hatherton, at Cannock.

You there complain of his lordship as one who discourages the development of the mines in this district by "overstanding the market," and particularly you refer to the condition that the minimum rental should be 4000*l.* a year. You write as if the payment of this would commence with the lease, and continue under all circumstances until the termination thereof. Had you been correctly informed of the facts we are sure you would not thus have given a wrong and injurious impression, as many persons who read your leader may never peruse this letter.

The truth is that for the first three years no minimum royalty whatever is payable, and for the fourth year 1000*l.*; fifth year, 1500*l.*; sixth, 3000*l.*; seventh, 4000*l.*; and, upon becoming acquainted with the 13th clause in the preliminary terms quoted below, your readers will further see how unfortunate it is when an Editor is led away by imperfect information, and publishes to the world that which misleads, and injures mining enterprise by misrepresenting landed proprietors, who will refuse to quote any terms at all, lest they should be held up as capricious as well as exorbitant in their demands.

13th clause.—"All questions arising between lessor and lessees respecting the carrying out of the lease shall be left to arbitration in the usual way."

So that it is clear that if the mines do not prove workable to a profit, not 1*l.* minimum royalty will have to be paid; if it can be proved that they will not fairly pay 4000*l.* at the seventh year, the lessees have their mode of protection.

If the mines are at all like those adjacent, 1000 acres (the area to be let) will, by proper working, produce much more royalty than the minimum stated. How, then, can Lord Hatherton be said to be "overstanding the market," we would ask? especially (as your article says) "if the scheme should be successful in proving the existence of coal at Huntington, the result to him would not mean 4000*l.* a year, but very much more."

If the coal should prove good and workable at the spot proposed for the trial sinking, and of which the company's mining engineers did not disapprove, other shafts would, doubtless, be sunk; but at present there is no need to sink shafts nearer his lordship's mansion, or erect chimney-stacks before his windows.

Lord Hatherton has offered every facility—has made terms in this matter far lower than those of adjacent mines, and if the project is not taken up as warmly as similar ones have been, and are now being carried out in the district, we can say that our surprise will only be equalled by our regret.

The Pleck, Walsall, June 27.

Mining engineers to Lord Hatherton.

ON INTERNATIONAL COMMUNISM.

SIR,—The accounts of their principles put forth by the Communists are merely an undisguised extension of the pleas urged in self-defence by some robbers convicted of felony. Both make the unjust inequalities of society their excuse for attempting their redress by the commission of crime. The only ultimate result of such a reconstruction of society as they attempt to bring about would, were it possible, be a speedy return to the semi-starvation of savage barbarism. Hostility to capital proves the grossest ignorance of the real elements of their position on the part of the working classes. Without capital exists, and is safeguarded, no single member of a commonwealth can have anything worth possessing, however small, however humble the portion which should belong to him may be. The sympathy with the ignorant, wicked principles and atrocious crimes of French Communism recently displayed by a small faction of our working population would, were it not contemptible from its insignificance, be a deep disgrace on the whole body. But it is mournful that even these few can venture to justify atheism, negation of all rights and duties, and contempt for the learning of the past, leading to arson and murder as the natural results of such brutal licentiousness. Were not such men abhorred and despised by the bulk of our working classes, as they abhor and despise the thieves and murderers in our own land, truly the enemies of their admission to any share in the election of Parliament would indeed have good grounds to say that such men are wholly unfit to be trusted in any way or shape with government. Nay, further, such advocates of crime are not, to use a fine old English word, *law worthy*. They are mere miscreants, without title to the protection of the social rights against which they rebel.

Benevolent theorists, lamenting the mass of crime and misery in the world, and neglecting or denying the worst and deepest cause of these evils—the depravity of human nature—have for centuries back sought remedies for the injustice of society in fanciful reconstruction of its framework and elements, hoping thereby to secure justice and happiness. From More's Utopia to Southey's juvenile schemes of pantheocracy (not to mention many other theories or day dreams), the leading features and failures of these schemes have been similar. But these men, however unwisely, were honest, and had real faith in right and duty, no less than in their pet delusive theories. They were far too able not to see that the robbery of society (setting apart the crime) was a false foundation for any reform. Spoilation they knew does not create anything, but has a natural tendency to reproduce itself, and is merely the first step (rapidly to be followed by many others) in the downward course to national ruin. Therefore, they sought to reconstruct society, taking the world, as they sought to take man, in primitive elements—founding colonies or settlements upon their own principles. Most of such experiments came to failure from various causes too speedily to run what may be called their natural life, and find natural death from the same cause that originally raised society from its primitive savage elements—the inequality and difference of individual powers and characters; causing, however low may be the level from which you start, some to sink to the bottom like dregs, others to rise to the surface. All the success of their colonising experiments depended upon selected elements freed

from laziness and rascality, and guided by able leaders. Where the bond of union was religious fanaticism, on a comparatively small scale, these communities (of which the Moravians are, perhaps, the most interesting specimen) have to some degree succeeded; and, on the whole, effected much good; deserving (however absurd may be some of their tenets and practices) the respect of all right-thinking men from their energy, devotion, and high sense of duty. These associations secure the equality and abolition of poverty which the French Communes profess to aim for. But, starting with the impulse of the genius and energy of their founders, they seldom secure a succession of leaders capable of keeping up the full force of movement—hence their natural tendency is to decline.

Returning to Communism, as recently rampant in Paris, it is obvious that all attempts to abolish misery and want by bringing all down to the poorest level are as senseless as would be the idea of lessening the mass of suffering from disease by infecting the healthy that all might suffer alike, rather than by curing the sick that as few might suffer as little as possible. Without hope and ambition existence would be intolerable to all men of any power of body or mind. What under the regime of Communism would have become of the thousands of working men who have raised themselves and their children in life, often to the highest stations? Their only reward would have been getting plundered as soon as they were worth plundering—killed, if they resisted the spoliation. The real friends of the Proletariat, with deep sympathy for all poverty, which is misfortune rather than fault, will help them, and rouse them to struggle upwards in the social scale, giving aid where needed to sustain those who cannot support themselves. This can only be effectively done by means of the very inequalities of fortune, which the Pantisocracies denounce. By no other help than increasing wealth—capital paying wages—can increasing population be saved from sinking into one common slough of the deepest misery.

A glance may be given to the suicidal folly of any men of a nation so quick-witted as the French making war upon education, civilization, art, and culture in a city like Paris, where the wealth of the working classes lies in their genius, taste, and artistic excellence. Carrying out their principles, these Communists would have reduced such men (many of them artists of rare ability) to the standing of mere hewers of wood and drawers of water, that all might be equal. And this Commune vaunted itself the friend of the working classes. Well may they pray, now when their sober senses are recovered, to be saved from such friends.

I have a word to say on the moral of this as bearing on the latest movements of Trades Unions amongst us, but must reserve it for another letter.

A MAN OF EXPERIENCE.

THE INDUSTRIAL TONTINE SYSTEM.

SIR,—The objections urged by "R. A." against the proposition of "Nemo" to raise money by tontine appear to me to be untenable. If the tontine can be so carried on as to ensure the return of 100% to the representative of every tontineer who may die before the end of the ten years the risk is merely nominal—certainly nothing like 100%, as "R. A." supposes. The debit and credit account of a subscriber who might die in less than ten years could not show a loss of more than 8%; thus, he would pay 90% for his 100% stock, and (say) nine years' assurance premium at 2% = 18%, making 108% in all, and his representatives would get 100% from the assurance company.

Now, it must, indeed, be a hard case if the dividends paid on the 100% stock did not amount to 2 per cent. per annum, yet that is all that is required to cover the assurance premium, and at least secure him from loss (except of interest) under any circumstances whatever.

H.

THE PATENT LAWS, AND THE WORKING CLASSES.

SIR,—In my former letter upon this subject (which appeared in the Supplement to last week's Journal) it was urged, upon grounds of individual justice and national policy, that the present patent system should be replaced by one simpler and cheaper. It is said by some persons that the system of granting patents for inventions is essentially vicious. No patent law at all is the ideal of those who use this plea, but, if we must have one, let it, like the present costly and complicated system, harass and discourage inventors as much as possible. There is some difficulty in arguing with those who seriously propose to abolish property in inventions. There would seem to be no more peculiarly sacred possession than the property which has sprung from a man's brain. An invention is a fresh addition to the world's riches. It had absolutely no existence until, with toil of body and mind, the inventor called it into being. If an inventor is to be robbed of the property which he has created, why should other property escape similar confiscation? If it is right to appropriate the result of genius, and patience, and skill in one case, why not in all? And, in such a case, why should property, which results from neither skill nor genius, be exempt? Why not deprive the author of property in his book, the manufacturer of property in his mill, the landlord of property in his land? Why should we not at once revert to the good old rule, the simple plan, that they should take who have the power, and they should keep who can? "I have seen with real alarm (says John Stuart Mill) several recent attempts, in quarters carrying some authority, to impugn the principle of patents altogether—attempts which, if practically successful, would expropriate free stealing under the prostituted name of free trade, and make the men of brains, still more than at present, the needy retainers and dependents of the men of money-bags." Then there is Mr. Macfie's highly poetical suggestion that inventors should be rewarded by the nation. The proposal is so manifestly impracticable, opens out such prospects of grievances, such possibilities of peculation, and has such a general air of romance about it, that few inventors will be deluded by so thin a gilding to swallow the bitter pill of legalised robbery involved in the abolition of property in inventions. It is urged by others that if the cost of obtaining patents is lessened to any considerable extent there will be a flood of "frivolous" patents. Processes, it is said, which were common when Adam delved and Eve spun will be re-clothed with all the dignity of new and important inventions.

But the present system of high prices totally fails to prevent the patenting of old processes. If it would be wrong and mischievous to allow a working man to pay (say) 10s. for a worthless patent, then it would be equally wrong to allow a rich man to obtain one for 175l. If there were no other evils more serious than this of "frivolous patents" connected with the prohibitory tariff now in vogue, we might be inclined to allow the middle classes that monopoly of mechanical folly which some of them appear to desire. The evil is one which afflicts the imaginary inventor more than anyone else, and if it were to attain magnitude, it is one for which a very different remedy should be provided. After all, the argument simply amounts to the proposition that all invention is to be discouraged for fear that some tares should get amongst the garnered wheat. In America, where every specification is submitted to a strict examination, and rejected if found to be destitute of novelty, no less than 5285 out of 19,271 applications were refused on this ground. As our patent system is one of simple registration, every one of those 5285 "inventors of already well-known processes" might have obtained and maintained a British patent, if rich enough to pay 25l. in six months, 50l. three years after, and 100l. in four years more. The existence of frivolous and obstructive patents is one of Mr. Macfie's great arguments for the abolition of patent right. Who is injured by them? Certainly not Mr. Macfie. "1947." Do I understand you correctly that your experience in the sugar trade does not lead you to say that the multiplication of useless patents in existence creates inconvenience and embarrassment in the prosecution of your trade?" To this question Mr. Macfie's answer was—"I wish to give the answer as bluntly as I can. Though they might be expected to be an annoyance to us, they are not, but any day they might become so. Judging from the reason of the case, one would say that they are mischievous. I know that they must be, and yet, as a matter of fact, patentees have patented things of so little value, and they have so neglected to push their business, thereby saving us the trouble of satisfying them by proof that there is no use being made of their inventions, that we have not found the multiplicity of patents a great inconvenience."

The present patent law has all the vices of class legislation. It weighs heavily upon the working classes, it operates unequally upon

* Royal Commission on the Patent Laws, 1864.

rich and poor, it enhances artificially the difficulties of the inventor, and is clogged with all kinds of cumbrous devices, serving no good end, and having apparently no object beyond exhausting the patience and purse of the patentee. The one imperative reform is to make the obtaining of a patent so facile and cheap to inventors that, as in America (where the low charges abundantly suffice to cover the expenses of the Patent Office), the patent law shall stimulate instead of obstruct invention; for it is to the inventive genius of the past we owe our present prosperity, and it is to the inventive genius of the present that we must look for aid in the national competition upon which we have entered, and which, if we are worthy of our fathers, we shall cheerily and confidently undertake.

ONE OF THE WORKING CLASSES.

THE PATENT LAWS, AND THE WORKING CLASSES.

SIR,—Your correspondent, "One of the Working Classes," propagates an altogether erroneous idea, especially in his comparison of English and American patents. In America each patent can only include one claim, but in England, although I believe it is prohibited by law, a specification with a single claim is an exception, and many inventors claim absolutely nothing, but make a general statement of an invention (which is very often not new), and obtain a patent upon that statement, reserving to themselves the privilege of explaining subsequently what they consider they are entitled to claim. This practice renders it equally difficult for the patentee of a new invention to support his rights, and for the manufacturer to oppose the payment of royalty to the holder of a patent for an old invention. Many of the patents granted in America are for mere designs, but are not the less valuable to the public, while the system of granting the patents is better for the progress of the country, because it does not prevent the public from getting the benefit of any improvement which may suggest itself to persons other than the patentee, like an English patent does.

As to the English and American numbers I think that, considering the number of separate claims that would be included, the comparison would be in favour of England. The great reason English inventors make so little by their inventions is that they attempt to claim so much, and the enormous fees for patents induces them to do this, that they cannot concentrate their efforts upon any particular part of their invention; in fact, they get "too many irons in the fire." Again, the opponents of the inventor are not, as a rule, the employers, but the workmen. If a workman is unfortunate enough to be an inventor his ideas are pillaged by the man working next to him, or his fellow-workmen declare that his invention would injure the trade, and thus prevent him from using it either for his own advantage or anyone else's. We ought to have nothing but seven-year patents for designs, and these should not cost more than 1l., of which 5s. should be payable upon sending in the application, and the remaining 15s. with the specification. Great inventions, like those of Arkwright, Cartwright, Bessemer, &c., should be extendible by Act of Parliament for the life of the patentee and his widow and children, or if he has none for his own life only. No patent should be extended until practically at work, but if at the end of seven years it were found that the invention were really in course of development, and still incomplete, the Patent Commissioners might certify that fact, so as to enable the inventor to apply for the extension upon completing his invention. Between the expiration of the seven years and the grant of the extension the inventor should have no claim for royalty, but no one should be able to work a certified patent without giving notice of his intention to do so to the inventor. The great object of all legislation should be to protect the inventor, and at the same time to prevent him from using his patent as an instrument of obstruction—an industrial barricade, as difficult of defence as of attack.

Birmingham, June 27.

ANOTHER WORKMAN.

IMPROVED JIGGING MACHINERY.

SIR,—From the descriptions and diagrams which have been published during the past few months in the Journal from your able correspondents, Messrs. Darlington and Spilsbury, it seems to me that the old Saxon hutch is about the best of the machines extant for mechanical jigging, and the crank arrangement for working the plunger appears to be the best mode of giving motion to the water—that is to say, if we must have a plunger to each sieve, but I cannot understand why this is at all necessary, for surely it would be just as easy to work eight sieves at least with each double stroke of the plunger as it is to work one by the present arrangement. This would be especially valuable where labour is expensive, and there would be no difficulty in arranging the apparatus to work with the same water over and over.

To carry out this idea the plunger, or piston, should work horizontally instead of vertically, so as to work on the back stroke as well as on the fore stroke, and half of the sieves should be worked with each single stroke. The hutch proper, or the portion under the sieve, would be constructed with the valves opening in towards the sieve, as usual, and the plunger-case would consist of an oblong water-tight box, with a piston worked to and fro with V-pieces or bell-cranks affixed to the bottom ends. The rods connecting the bell-cranks with the motive-power is all that would require packing, and I believe that altogether the cost for (say) eight sieves would not be more than two-thirds of what they would cost as arranged at present; and, in addition to this, less power would be required to work them. I should have mentioned that on each side of the piston there must be an inlet from the reservoir with valve, as otherwise the jerk of the water so necessary in jigging cannot be obtained.

June 28.

M. E.

THE PHOSPHATIC NODULES OF SOUTH CAROLINA.

SIR,—Perhaps you will allow me to add a few words to my letter of April 15, on "New Phosphate Rocks," in which I have alluded to the Charleston Phosphate, which is now being imported into this country in considerable quantities. The discovery of these phosphatic nodules is highly remarkable. Since the year 1824 several eminent men had been commissioned, at different times, to report upon the geology of South Carolina, and all of them allude to its extensive beds of marl. Professor Toumay, who made his final report in 1846, stated that these marls contain a small quantity of phosphate of lime, and others asserted that they would prove beneficial to agriculture; some of them were said to yield 4 to 10 per cent. of phosphate of lime to analysis. However, it was only in the spring of 1867 that Dr. N. A. Pratt, late Professor of Chemistry in Oglethorpe University, Georgia, was fortunate enough to discover that a bed outcropping within 10 miles of Charleston contained a very much larger proportion of phosphate of lime. This bed has been long known as the Fish bed of the Charleston basin, and Prof. F. S. Holmes has obtained from it no less than 60,000 specimens of sharks' teeth, some of immense size, weighing 2 lbs. to 2½ lbs. each. It is found outcropping on the banks of the Ashley and other rivers of the district. Dr. Pratt took specimens of the nodules or conglomerates for analysis, and the results obtained in his laboratory were very surprising. He found first 34, then in other specimens 55, and finally upwards of 60 per cent. of pure phosphate of lime in them. Such, indeed, was the origin of the formation of the Charleston Mining Company, which now sends phosphate of lime to our markets. Besides the sample from a large bulk in Liverpool, which gave me 57 per cent. of phosphate of lime, as stated in my last letter on this subject, I have also received a very fine specimen of the nodules themselves, lately sent to England, which have yielded in my laboratory 60 per cent. of phosphate of lime and the exact geological position of these nodules. It appears to be rather a disputed point; and Dr. Pratt's view of the subject may be seen in his highly interesting paper, entitled "History of the Marls of South Carolina," &c. (Philadelphia, 1868); but I still think their age is similar to that of some of our phosphate deposits in the South of England. Ten years ago I analysed specimens of fossil phosphate from the greensand formation of the Isle of Wight, which were very rich in phosphate of lime. The discovery of the richness of these Charleston nodules, made by Dr. Pratt, will not be without influence upon the future commercial prosperity of South Carolina. I am of the opinion, that these nodules are derived from the bones and excreta of extinct animals. They are more or less water-worn and rounded at the angles; some of them are large, and weigh upwards

of 1 lb.; when broken with a hammer they emit a peculiar bituminous odour, and I find that they contain a certain quantity of some kind of bitumen. This reminds me that some of our English geologists hold that all bitumen is of animal origin, though chemists are accustomed to look upon it as derived only from vegetable substance. Perhaps both theories are true to a certain extent; but however that may be, the geologists are evidently right in the present case. Of all fossil phosphatic materials hitherto discovered, the Charleston nodules most resemble bone, both in appearance and composition.

T. L. PHIPSON, Ph.D., F.C.S.

Laboratory, 4, The Cedars, Putney, London, S.W.

SILVER MINING—ENGLISH AND FOREIGN.

SIR,—At present there seems to be quite a furor for foreign silver mining; perhaps "distance lends enchantment to the view," for we assured we have as successful silver mines at home, in proportion to the capital employed, and when fully developed, as there are to be found in any part of the globe. The saying is that distant fields look green, but let us not overlook the richness of our home pastures, which are the more easily looked into, and which will give increased satisfaction in the fact that we are assisting in the development of the best country in the world in every sense. "Old England for ever," say I, and if the tenth part of the capital spent on foreign mines were legitimately spent at home Old England would not be excelled in the production of any metal except gold, and I question if we might not produce considerable quantities of that. As to silver there is an abundance of it, and it can be obtained at a profit not exceeded by any foreign company, if in any instance equalled. Be assured that every word of this can be borne out by honest facts. The original silver mine of this district produced more than 300l. worth of silver for every fathom of ground taken away, and the hardest of it can be taken away at 5l. per fathom; tens of thousands of tons are to be found in the old burrows throughout the entire district that will produce from 10 to 50 ozs. of silver to the ton. The Queen Silver Mine has already commenced to turn it to a profitable account, and others are following suit as fast as possible. Some Manchester gentlemen have purchased the freehold of the old original rich silver mine before referred to, and are opening on a lode from which silver ore has been lately taken worth 4s. per ounce as broken. Other samples have been assayed, producing respectively 4600, 1703, and 130 ozs. of silver to the ton; and in conversation with a gentleman yesterday, who has no connection with the mines, he assured me that he had ascertained from assays that some of the old burrows average 18 ozs. of silver to the ton, and when it is considered that this can be extracted at a cost of 1l. per ton, or 4 ozs. of silver, leaving 14 ozs. per ton clear profit, it is easy to calculate the value of 20,000 tons of these old burrows. Of course, purchasing the freehold for mining purposes is not the usual mode, but I am led to the conclusion that in this instance at least it is a very sensible plan. Take the royalty on the 20,000 tons of old burrows only at 1-12th, the usual rate, and you have a sum of 7500l., more than half of the paid-up capital of the company, and then they have more than 2000l. worth of most valuable buildings. One is a most desirable gentleman's residence, beautifully situated, with a very pleasant southern aspect, and valuable land, which runs on the course of four rich lodes to the extent of 250 fathoms. I say and maintain that if this property were several thousand miles away 100,000l. would be subscribed to it without a word, but when you talk of silver mining at home the mining public seem to regard it as only existing in imagination; they can scarcely be made to believe the fact that at the present time, within a mile of this place, large quantities of silver ore is being raised, and every expense paid, on 10 per cent. of its value. All we want to place silver mining on a par with any other class of mining in this country is for mining capitalists to assist those practically acquainted with the matter who are honestly endeavouring to bring it about. Every Englishman will I am sure feel with me that it is pity that such known wealth should lie dormant at home while such vast sums are subscribed to support foreign mines, and to the benefit of foreign countries. I will return to this subject again.

Harrogate, June 28.

C. PENGILLY.

SCIENCE AND THE EMPIRIC ART INSEPARABLE IN MINING.

SIR,—Mr. Robert Knapp has vastly improved in his style, for his letter in the Journal of June 17 is simple and intelligible. Mr. Knapp complains that I have submitted the quotation from his letter to a process of "jugglery" by substituting the word "an" for "no." I will ask you to refer to the MS. of my letter, and say if this be my mistake or the printer's. If my mistake, I beg to offer Mr. Knapp my apology for an unintentional misquotation of his letter. When Mr. Knapp states that he is a practical miner I am prepared to find every excuse for what can only be spoken of as a fault in his style—a tendency to verbosity and grandiloquence. I hope he may not be unwilling to take a hint, because if he persists in adopting that style, the "matter," which may be very good, will be lost in the manner or style, which is very bad.

It is not for me to say in what useful undertakings I am engaged, because the enumeration of my useful labours would not elucidate Mr. Knapp's letter, which is all I have to do with. I had no ambition to gratify in writing my critique, but desired only to secure for myself and fellow-readers a clear and unclouded statement of the views which correspondents may wish to lay before us in the Journal.

CRITIC.

[* On reference we find that the error was in the copy forwarded by "Critic."]

SCIENCE AND THE EMPIRIC ART INSEPARABLE IN MINING.

SIR,—I think both you and your readers will agree with me that a prolonged discussion between Mr. Knapp and myself is not desirable. It would probably terminate where we now find it, Mr. Knapp being very much annoyed at my remarks, and I still disposed to think much of his original letter involved and ambiguous. Why does he call the Art of Mining "The Empiric Art?" I understand empiricism in art, but I have never yet understood there was any which might be specially called The Empiric Art. I am also prepared to hear of "an empiric." I do not mean to say Mr. Knapp is an empiric, though he is inclined to empiricism. Hence I have called the title of his letter strange.

I am better able after Mr. Knapp's recent explanations to understand the views which he had intended to convey. If he had not attempted the lofty style and "figurative expressions" of what we may now designate the "obnoxious paragraph" I should probably have comprehended them before. If it were "ungenerous" to tell him that I was unable to comprehend that paragraph, and that as it stands to me it appears simple nonsense—if it were "disingenuous" for me to say that I entirely oppose Mr. Knapp's view that mining is not subject to scientific principles—I must submit to those epithets. But, Sir, I wish to be busy about the advancement of knowledge, so far as I can help it forward, and to prevent the dissemination of erroneous opinions. By no other feeling am I actuated, and Mr. Knapp will do well to adhere to the same principle in replying to my remarks.

As your readers may have forgotten "the obnoxious paragraph" I will here reproduce it. Mr. Knapp says:—

"An error to which mankind are very liable when light dawns upon a truth is to begin its elucidation at the wrong end or in the wrong way. Sometimes by attempting to separate essential parts of the same thing, and to set in independent motion things which can only obey reciprocating influences. A similar error has been committed by attempting to eliminate harmonious responses by an arbitrary union, or union by forces, of heterogeneous elements having no affinity for each other, and the tendency of whose natural aptitude is to gravitate transversely, or diversely, to each other, and hence can never act in the same plane and escape collision."

If this passage is an example of the "figurative expression" which Mr. Knapp considers necessary to save his writings from "prolixity," he has very much mistaken their effect, for anything more tedious, unconcise, and prolix I cannot conceive.

I believe Mr. Knapp knows a good deal about practical mining, and if he would stick to his subject, and tell us what he knows in a simple, unpretentious manner, I should for one be wiser, for I could learn from him; but when he loses himself in the ambiguities of the "obnoxious paragraph" he is doing no good to himself or his readers. I had said "The readers (of the Journal), however, have a right

to ask that the communications shall be made by the writers in language that can be understood." Mr. Knapp's rendering of this is—"Critic" is of opinion that the readers of the Journal have a right to ask that the vials set before them in its pages should be congenial to their palates." That is far from the meaning of what I said, and there is indeed a wide difference between Mr. Knapp and myself "respecting the import of language" if this is his rendering of my observation.

I do not suppose that you, Sir, as the editor of the *Mining Journal*, would care to make yourself responsible for the views of your correspondents. You would, probably, refuse to admit anything very scurrilous and ungentlemanly, but you would admit popularly written letters, expressing every variety of opinion. Mr. Knapp's retortations do not answer my objections to his letter.

JUNE 26.

UTILISATION OF MINERALISED WATER.

SIR.—In the very interesting letter of "Patentia," published in the Supplement to last week's Journal, upon the Parys Mountain Mine, a valuable reference is made to the extraction of the metal and other valuable matter contained in mineralised water. If your able correspondent would give some further details he would, I am sure, confer great benefit upon a large number of your readers. He tells us that the reservoirs forming the precipitate pits are some acres in extent, bricked and cemented, and having old iron spread upon the floors. The mineralised water from the levels, and also the rain water, after passing through the immense heaps of debris, is led into these pits, depositing copper upon the iron scrap. Now, I should be glad to know whether these precipitate pits are formed as large as space can be afforded, or whether they are built in series; also, what is the depth, &c. Again, how long must the water remain in the pits, and what quantity of iron must be placed upon each square yard of bottom. I suppose, from the statement that "the annual produce from this source is about 350 tons, of the value of 87, per ton," that the iron and copper get mixed together, or combined, because copper precipitate, as I see from the tables of Swansea sales, fetches nearer 28s. per ton.

The system of obtaining a produce worth 87, per ton by a simple and inexpensive process would indeed be a great boon to many mines, because it so often happens that there are no facilities for conducting the somewhat complicated process of obtaining the pure precipitate, although if it were merely necessary to build a calcining furnace, and a few precipitate pits, it could readily be done. The next great question would be—how much water must be stored at a time, and how long it must be stored for? I understand from "Patentia" that the water after it leaves the precipitate pits still contains some metal in solution, so that I suppose we should not be permitted to let it escape into the river; and I should, therefore, like to know whether by "Patentia's" process all the poisonous matter could be collected in the precipitate pits, or whether the ochre ponds must be added. If so, perhaps he will state the dimensions and the mode of constructing the ochre pits. Of course, if the ore can be quarried, as "Patentia" mentions, it might happen that Parys Mountain could treat with profit lower produce ore than many other mines; but there could be no difficulty in a large number of Cornish mines in placing the low-produce refuse in such a position as to make the waste water from the dressing operations run over it, so as to get out whatever metal was capable of being got out by the method described.

There is another matter in his letter that should also receive the attention of Cornishmen more than it does—that is, the arrangement of the dressing apparatus under cover. I believe that whatever conduces to the health and comfort of the workpeople is a real economy in carrying on works, as it keeps them always in better spirits, and they get through more work, without fatigue; and the suggestion of "Patentia" that the girls engaged at the jiggings machines should be protected by a roof over their heads might well be adopted in every mine. I would, indeed, have every dressing-floor made under cover, and I am sure that it would prove economical in more ways than one. In the first place, there would be less waste of space than at present; next, the machinery would last much longer; and, again, machinery superseded by improvements would more often be utilised than at present. Now a machine superseded is usually left to rot, although with a little thought it might be kept usefully at work until worn out.—JUNE 26.

ADVENTURER.

OUR MINERAL WEALTH—WHAT WOULD SOCIETY DO WITHOUT IT?

SIR.—The phenomenon of mineral deposits is daily becoming clear and distinct to earnest and searching students of Nature's laws, and the principles discernible throughout the earth's stratification, and their application in the formation of mineral deposits imbedded therein. Practical geology is one of the most pleasing, and at the same time the most profitable, of all the sciences; it contributes to the wealth of the world, the employment of its people, the advancement of the sciences, the extension of commerce, and the construction of railroads, ships, bridges, buildings, and architecture of all kinds and character, whilst, next to agriculture, it yields the greatest revenue and employment of all our home industries.

Unlike agriculture, however, which becomes absorbed in the sustenance of man and cattle, the hidden products of the earth are not necessarily consumed, for year after year the monuments of the age, the coffers of the Bank of England, in all their magnitude, usefulness, and power, attest the contrary; the telegraph for the world for communication and dispatch, railroads for locomotion, the extension of trade and commerce dependent on railroads and ships, both at home and abroad, our Post Office conveyances and their efficiency, the noble edifices and mansions that adorn our metropolis and the provinces, all and each confirm the vast importance and worth of our metallic and mineral yield, whilst their very existence and application prove that the very basis of society, the intercourse of its members, and the chief wealth of each and all, is estimated by a metallic standard. What would our currency be without gold, silver, and copper? Where would we find a substitute for tin in the manufacture of utensils and domestic culinary articles of daily use?

It is satisfactory to know in the face of the stupendous strength of the Bank of England, and of the nation at large, that our mineral wealth shows no falling off in yield, that as fast as one deposit of ore is wrought another becomes discovered, and that from recent advices there seems to be no approach to even incipient exhaustion. The large yield of iron and coal astonishes the world, whilst America and Russia are obliged to come to our marts to supply their necessities. Tin is in active demand, and there is every prospect of Cornwall increasing her supply; yet to all appearances the requirements of the continents of Europe and America will materially advance. Spelter is gaining ground as a useful and necessary metal in the roofing of buildings, construction of fences, sheds for cattle, and a variety of temporary purposes. Lead is profitably worked by a numerous scattered body of speculative capitalists, extending throughout Scotland to North and South Wales, the Midland and Northern Counties of England, and westward even to Cornwall.

Copper mines in England are not so extensively wrought as formerly; the price of that metal, consequent on foreign competition, has become greatly depreciated, still we have South and East Cornwall, West Seton, Devon Great Consols, and a few others that continue to pay regular and large dividends, more especially so when compared with the small capitals called up. The chief prizes, however, in Cornwall are the mines that in former years were exceedingly rich for copper, but now yield vast quantities of tin, and very large and remunerative gains. The circumstances of success are varied in each instance, but the cardinal ones are clearly established—the large sections of the various lodes laid open in extracting the copper, the quantity of unwrought ground standing high, dry, and "developed," poor for copper, but rich for tin, and when the price rose from 40s. to 45s. up to 60s., and now is exceedingly remunerative when it is at 82½ to 85s. per ton. The results are wholly different from those established 10 years ago; and it is unquestionably a fact that tin mining in Cornwall, so profitable to those interested at present, is almost unrecognised by the public in their speculative dealings.

We know of many mines at present neglected which present evidences of mineral wealth, that shortly will become developed; then

attention will be directed to them, and the prices of shares at which purchases can now be made will advance three to five, and even in cases tenfold. There is a time to buy as well as to sell. We recommend the "investor" to enter the "quiescent" market, and select an article that he can realise when, from inherent worth, the general public are forced to recognise it at double or treble price.

R. TREDINNICK,
Consulting Mining Engineer.

3, Crown-court, Threadneedle-street.

EAST EUREKA MINING COMPANY.

SIR.—My attention has just been drawn to a letter in the Supplement to the Journal of June 17, from Capt. Thomas Faull, of Grass Valley, giving a very interesting account of the position and progress of the East Eureka Mine.

The subjoined report, recently issued by the directors of this company to the shareholders, with the report of Mr. Bell, C.E., annexed thereto, will, likewise, I think, interest your readers. It is highly satisfactory to find so experienced a miner as Capt. Faull so entirely confirming it in every particular.

JOHN H. ARMSTRONG, Sec.

17, Buckingham-street, Strand, June 29.

June 7.—The directors have much pleasure in reporting to the shareholders that they have now completed the purchase of the East Eureka Mine and Works. Annexed will be found the report of Mr. Valentine Bell, M. Inst. C.E., dated May 1, 1871, on whose recommendation this purchase has been made. Since that date the directors have had several letters from Mr. Rigby, the superintendent, reporting that the erection of the mill was progressing, and that the mine was opening up very satisfactorily. In the telegram received on the 4th instant he states that the mill will be completed and ready for work on the 25th of this month. In his last letter he states that everything is ready for setting the mill to work as soon as it is completed, and that he had already 600 tons of ore out in the dump ready for crushing. Consequently, the directors feel justified in holding out to the shareholders good hopes that in the course of the autumn a sufficient sum will have been earned and remitted to this country to enable them to pay a good dividend on the shares, which they trust will be only the first of a series occurring at short intervals.

TO THE DIRECTORS OF THE EAST EUREKA MINING COMPANY (LIMITED).
May 1.—In accordance with the instructions which I had received, I left England for California on Oct. 1 last, and arrived in Grass Valley on Nov. 5. I immediately made a thorough examination of the East Eureka Mine and Works, which property consists of—1. A mining claim, 2500 feet in length, on the ledge known as the McFarland Ledge, and situated on Union Hill, about two miles east from the town of Grass Valley.—2. A small plot of ground, with a building containing pumping and hoisting machinery, and a 30-horse power engine and boiler, and some outbuildings, stables, &c.

The vein of auriferous quartz has been thoroughly proved on the surface for a length of about 1800 feet, by a series of shafts about 20 feet deep, from which has been taken a considerable quantity of good paying rock. The main working shaft at the hoisting works is 180 feet in depth. At 100 feet down this shaft a drift has been run along the vein for a length of 800 feet, and a drain tunnel about 300 feet long has been run in from the hill side, intersecting this drift about 200 feet from the shaft. In this drift the vein has never been lost, and varies in thickness from 8 in. to about 4 feet, the average being from 2 feet to 2 feet 6 in. From this drift and from the surface workings a very considerable quantity (probably upwards of 2000 tons) of rock has been taken by the various companies of miners to whom the mine has been let from time to time during the past five years, and has always been very remunerative, notwithstanding the considerable expense incurred in carting the ore from the mine to the mills in the town, a distance of about three miles, over a very bad road. I ascertained from the owner of the mill where this ore was crushed that the average yield has been fully 25s. per ton. The highest was as much as \$138, the lowest was \$10. Considerable quantities yielded as much as \$50 per ton. Two batches of rock, crushed while I was in Grass Valley, yielded an average of \$40 per ton. In consequence of my advice, a sum of money, sufficient to discharge the existing liabilities on the property, was remitted to me. I was also authorised to enter into a contract for the erection of a 20-stamp mill, and accordingly I prepared plans and specification for this mill, and gave the contract to Messrs. Goddard and Co., of the Pacific Ironworks, at San Francisco. I was fortunate in securing the services of Mr. A. J. Rigby, who is well known in California as an able mechanic as well as an experienced miner, to take charge of the mine and to superintend the erection of the mill. I must also acknowledge myself indebted to Mr. William Watt, of the Eureka Mine, to Capt. Hoyle, of the North Star Mine, and Mr. Nasmith, of the Empire Mine, for a great deal of valuable advice and assistance in deciding on the designs of the mill, which, when completed, will, in consequence, be equal if not superior to any in the country.

There can be no doubt that the vein in this mine is the continuation of the vein in the Eureka and Idaho Mines. Only 600 feet intervene between the boundaries of the Idaho and the East Eureka; the veins have been traced to within a short distance of the boundaries of both properties, and their directions produced are in one and the same straight line. The ore from the East Eureka Mine is similar in character to that of the Eureka and Idaho, and has proved superior in quality to the ore taken from the same depths in those mines. The Eureka Company, with a 30-stamp mill, has for three years past been realising a net profit of from \$30,000 to \$40,000 per month, which is equal to 80,000l. per annum. The Idaho, with 15-stamps, is yielding in equal proportion. The owners of the East Eureka may then look forward with confidence to realising an equally good profit per stamp from their mill, so soon as the mine and mill shall be in regular and perfect working order, as in a very few months both ought to be. This 20-stamp mill, now in course of erection, will, when completed, yield a net annual profit of upwards of 50,000l., which may be increased hereafter by putting up additional stamps, should the mine turn out as rich as we have every reason to expect. In conclusion, I confidently recommend the directors of the East Eureka Mining Company to complete without delay the purchase of this mine, and also to retain the services of Mr. A. J. Rigby as superintendent.

IMPROVED STAMPING MACHINERY.

SIR.—While in Cornwall a novel arrangement for increasing the grate-way in stamping machinery, introduced by Capt. Wm. Tregay, of Redruth, came under my notice, and was referred to in my communication to you (which appeared in the Supplement to the Journal of Jan. 10) while on my tour. It consists of a "coffer," constructed partly of cast-iron, in such a manner that a cast-iron frame is fixed at each end of the "coffer," to which the uprights which carry the guides are bolted. This cast-iron frame stands outside the oaken uprights, and outside the oaken coffer front, thus leaving the angles clear all round for the grate, which thus extends from the back part of coffer, across the end, around the angles all the length of front, and across the other end to the back of coffer on the other side. This, with the ordinary size stamp "coffer" for four stampers, and with the grate the same distance from the head as heretofore, gives 5 ft. 6 in. in length of clear grate-way, against the old method of about 2 ft. 6 in. There are 16 stampers at work at Pedu-an-drea United Mines on this principle, and the quantity of tinstuff stamped by them over the old plan is proportionate to the difference in extent of grate-way, the power used, weight of stampers, and all other things being equal.

I thought this improvement worth calling your attention to, and if "Miner," or any other of your readers, should require a more particular description, I have no doubt but that the inventor and constructor will be as ready to supply it as he was to show me the machine at work on my visit.

A CIVIL ENGINEER.

London, June 29.

THE MARAZION DISTRICT.

SIR.—About the year 1785 the first of a number of mines wrought for copper in Cornwall is called Wheal Jewell, situate in the parish of St. Hilary, in the township of Marazion, manor of St. Michael's Mount. The lode is of an average width, from 5 to 12 ft., and yielded at that period the richest yellow sulphuret of copper ore ever raised in the county, except at Wheal Harmony and Montagu Mines, near Redruth. The present Wheal Jewell is on a parallel lode, about 100 fms. south; and about the same distance further south is the Great Wheal Neptune and Tolvadden lode. About half a mile east of the old Jewell lode is Wheal Caroline, which was a rich and productive mine for several years. These lodes have had but partial trials, owing to very inefficient machinery at that time, and wrought chiefly by some small farmers and tradesmen in the locality, who usually abandon mines as soon as dividends cease to be paid, whether from poverty of the mine or depression in the price of the minerals. The first 60-inch cylinder engine ever erected in Cornwall was made in Glasgow, by Boulton and Watt, and put up on this mine. This engine was removed to the Godolphin Mines, a few miles distant. Owing to a great discovery of very rich ore, a few feet below the surface, by a man streaming for tin in the Godolphin Valley, this mine was the means of large fortunes being made, particularly by the house of Messrs. Williams, of Scorrier. Wheal Jewell and South Wheal Jewell were also rich mines, discovered by Messrs. Williams and Co., and paid in dividends several hundred thousand pounds.

About two years ago operations were commenced on a lode running parallel to the first Wheal Jewell and Great Wheal Neptune, a lode of the greatest promise, near the surface averaging 6 to 8 feet in width for about 120 fms. in length. A powerful engine is now erected, and a shaft sunk about 48 fms. from surface, in a beautiful channel of ground for copper ore. This is a very extensive set, and known to contain several parallel and very promising lodes, and including also the old Wheal Jewell set, wrought only to the depth of 50 fms. Below the adit or day level returns of ore are being made. The third sampling, of 42 tons, occurred on the 20th inst., with every

prospect of rapidly increasing. A more beautiful gossan, with an abundance of mundic, white iron, &c., has not been discovered in Cornwall for many years. This mine will probably be the means of other mines being discovered in the district. This locality has invariably been celebrated for the rich quality of the copper ore. Two or more very promising tin lodes have been discovered in this set, and large quantities of tin returned by horse-power only, at shallow depths. These lodes will, most probably, at no distant period be as rich for tin as copper. More encouragement is now given by the lords of the soil than formerly. Some gentlemen have recently granted extensive sets at a 30th and 40th royalty or dues, and no doubt will be liberally rewarded in the future. The great depression in the price of copper during the last few years, it is to be hoped, is at an end, and brighter days appear to loom at no very distant period for copper mining in Cornwall.

A. BENNETT.

June 26.

MINING IN CARDIGANSHIRE.

SIR.—Last week I had to go over most of the mines already reported on, and am glad to be able to say, on the whole, they are much improved from Esgrig Lle down to the Powell United, including all the mines that I have reported on for weeks past. The late beautiful rains in this neighbourhood have again set all water-wheels revolving, and the miners are once more toiling on to bring to surface the mineral by which we mining people live. The WEST ESGRIG LLE looks well both in the shaft and in the back of the adit level, and they are making fair progress on the surface work. GLAN CASTLE is also much improved, considering the very shallow depth of its workings. NASTY-MOCH is also in better mineral-bearing ground, and I shall not be surprised shortly to hear of a good lode in the shaft. DINAS MINE is also improving, the lode turning out some nice spots of lead, and the further they drive the deeper from surface will be their workings. I must for the present forego speaking of the Ponterwyd range of mines, as the central part spoken of some few weeks ago has been added to the CLARA MINE, making this property very valuable. The POWELL UNITED speaks for itself in its regular monthly sale of mineral.—In fact, I do not know, so far as I have gone, one that is doing better than this valuable little mine.

I will try next week and give your readers a report of the different mines north of Gloglan, beginning at the Bwlch Consols down the valley as far as West Bronffordy—the most western extremity of mines in this part of the Cardiganshire mining district.

SAMPOSON TREVETHAN, M.C.E.

Tynllidiard, near Aberystwyth.

MINING IN CARDIGANSHIRE.

SIR.—I have read the reports, or rather brief descriptions, of this mining county, signed "Sampson Trevethan, M.C.E.," and am sorry to see that the writer, being a Cornish man, should depreciate the merits of his own countrymen. It is well known to most mining speculators that in every country in the world Cornish agents and Cornish miners are to be found, and I can speak from long experience that there is none equal to them in skill and judgment. A Cornish or Devonshire working miner of common sense is more than a match for any other, come from where he may.

A SUBSCRIBER.

TERRAS TIN MINE.

SIR.—Mr. M. Rickard, in his report (May 10), says they have commenced working in the bottom of the deep elvan, and find the stuff 300 lbs. to 400 lbs. to the ton; Mr. James Harris James (May 20) says they are down 12 ft., and that if the stuff only continues to improve in depth as it already had done, it will be marvellously rich; Mr. M. Rickard says it has continued to improve—*craps*, 600 lbs. of tin per ton of stuff for the present bottom must be below the mark. Taking 12 cubic feet per ton gives this part of the mine as worth upwards of 350l. sterling per cubic fathom—so, supposing the 200 heads of stamps to reduce 200 tons of stuff per day, the day's turn over would amount to over 400l., and the stuff is then to last at that rate many a long year.

But even this, brilliant though it confessedly is, is dwarfed when we come to consider the rich lodes, valued by Mr. James in his above mentioned report at 60 per cent. of pure tin; 200 tons of this tinstuff will amount to the stupendous sum of 9120l.

And yet, after all this, we find these shares at the miserable price of 2l. or 3l. each. Why, if there is any truth in figures, these shares should stand at 100l. each at the least.

A WANDERER.

VAN CONSOLS, AND EAST VAN MINES.

SIR.—Will you permit me to ask, in the *Mining Journal*, what has become of Van Consols? I seldom see it quoted, and I should be glad to learn whether the new capital has been fully subscribed or not.

East Van has just been introduced to the public, in 15,000 shares, of 5l. each, and 60,000l., as it appears, goes for the purchase of the mine. Beyond this, the shares have risen to 10l., which is equal to 150,000l. for the property. But Van Consols, which some practical people consider as good a set, and more developed, appears to be unsaleable at 15,000l. How is this?

AN ANXIOUS SHAREHOLDER.

Bristol, June 27.

[For remainder of Original Correspondence see to-day's Journal.]

FOREIGN MINING AND METALLURGY.

Deliveries of coal from Belgium have displayed rather more regularity this week, but there are still some complaints as to want of rolling stock. Prices are well maintained. In some basins, however, stocks are rather considerable; in the Couchant de Mons the accumulations on the banks of canals amounted on June 1 to 3,413,000 hectolitres, or 1,300,000 hectolitres more than at the corresponding date of 1870. The stocks at pits' mouths also amounted to more than 600,000 hectolitres, while at the corresponding date of June, 1870, they stood at 235,000 hectolitres. The quantity available for consumption in the Couchant de Mons was thus nearly 1,700,000 hectolitres more at the commencement of June this year than at the commencement of June, 1870.

In an interview recently obtained with the Belgian Minister for Foreign Affairs by the members of the Charleroi Forgemasters' Association, M. d'Anethan promised to give his attention again to the question of a line of railway between Athus and Givet. This information has been received with satisfaction, but still Charleroi industrialists display a certain impatience upon the subject. The order books of the Belgian forgemasters are pretty well filled, and some important transactions are stated to have been concluded on foreign account, but one of the best former foreign clients of Belgium—Russia—now sends only very few orders. This circumstance is due to the fact that metallurgical and mechanical industry has acquired a great development in Russia, and that most of the new Russian railway companies agree by the terms of the concessions granted to them to purchase a large part of the materials which they may require in Russia. On the other hand, Austria and Hungary, which are pushing on their railway networks, are sending a good many orders to Belgium. Casting pig has shown a little feebleness, and has receded in some instances 2s. per ton. Refining pig has been held much better; it has displayed firmness, but at the same time there has been rather a wide range in prices, according to quality. A special pig, which has been rather sought after, has been spiegel, for which certain blast-furnaces have acquired a high reputation in England and Germany, especially in Austria, to which country important deliveries are regularly made. The Vieille Sambre Works, at Chatelet, are to be brought into operation next month at Chatelet, under the direction of M. Hovine. The La Haye Collieries Company will pay to-day (July 1) a dividend of 1l. per share on account for 1870-1. The Val-Benoit Collieries Company will also pay to-day a similar dividend. The Solesmin Blast-Furnaces, Ironworks, and Collieries Company will pay to-day statutory interest at the rate of 5 per cent. per annum.

A circular from the French Minister of Public Works addressed to the prefects throughout the Republic announces that no suspension of navigation will take place this year on the rivers and canals in the French territory. The decision has been officially adopted because the injury which a suspension of navigations would involve would be very considerable, especially at a moment when the general revival in affairs requires that industry should remain in possession of all possible means of transport. Exceptions will only be made to the ruling of the Minister in cases in which the execution of indispensable works imperiously calls for a suspension of navigations. Iron is still in comparatively little demand at St. Dizier; the group has given such few signs of life during the past year that it may almost be said to have been forgotten, and it has not yet recovered from the severe depression and the cruel difficulties resulting from the war. Rolled iron from charcoal-made pig is now quoted at St. Dizier at 10l. 16s. to 11l.; ditto from coke-made pig, at 9l. 12s. to 9l. 16s. per ton; sheets, first category, have brought 10l. 16s. to 11l. 4s. per ton, according to quality. For charcoal-made pig 4l. 16s. per ton has been lately paid; mixed pig, half-coke made, has realised 3l. 16s. per ton. The coke-made pig of the Meurthe district has no very clearly defined price at present. Producers affect to believe in a probable rise in consequence of the dearth of coke, the limited number of blast-furnaces remaining in the East of France, and a general impression that in order to replace the great works of German Lorraine, the French iron trade will endeavour to acquire a

fresh development on the newly-prescribed frontier. On the other hand, in consequence of the maintenance of their old prices by the forges in the North and South of France, purchasers refuse to accept the advance asked for in the Meurthe, and trade remains for the present in a state of indecision. The Graissessac United Mines Company has announced a dividend for 1870 of 14.4s. per share; half this dividend, or 7.2s. per share, has been payable as from June 15, and the balance will be distributed on December 15. The Douges (Pas-de-Calais) Coal Mines Company has been paying during the last few days a dividend of 8s. per share.

Some transactions in United States copper have taken place at Havre, 6 tons of Lake Superior having found purchasers at 77.4s. to 78s. per ton, Paris conditions. Chilean bars have made 70s. per ton, 25 tons having been disposed of upon those terms; pure Corocoro mineral has made 69s. 4s. per ton, Paris conditions. At Marseilles, Toka and Spanish have brought 70s.; refined Chilean and Peruvian, 72s.; rolled red copper in sheets, 80s.; and round ditto, 84s. per ton. The German copper markets have not presented much animation; at Cologne, however, the article has been held rather better. In Holland there has been no change. At Havre, tin has completely made default. At Marseilles, Banca has been quoted at 146s., and English at 150s. per ton. In Holland an advance which had been noted in prices has made further progress; for Banca as much as 79s. have been paid. Disposable Billiton makes default; floating cargoes have realised 78s. In lead there has not been much activity; prices have been maintained at about the same level. Zinc appears to be improving; at Hamburg, at any rate, transactions have displayed rather more activity.

SILVER REFINING.—Dr. F. Gutzkow, late manager of the San Francisco Assaying and Refining Company, has recently described to the Chemical Society, Berlin, a new method of silver refining, which he discovered and introduced in California. In the old process silver was reduced from dilute sulphuric acid solutions, by metallic copper; but the increased production of sulphate of copper as a by-product of many manufacturing processes, rendered this method a very costly one, on account of the difficulty of selling the blue vitriol without loss. The plan Dr. Gutzkow at length adopted was as follows:—He dissolves the ingots in hot concentrated sulphuric acid, and then pours his hot turbid fluid into a cast-iron cauldron, containing dilute sulphuric acid, sp. gr. 1.617, heated to 110°. When the liquor has become clear it is syphoned off into another cauldron, and cooled by water externally applied. At the bottom of this vessel a yellow, coloured crystalline mass of sulphate of silver will be found deposited. The sulphate of silver is then removed with iron shovels, placed in a lead-lined box with a perforated bottom; and a very concentrated solution of proto-sulphate of iron (green vitriol) poured upon it. A portion of the silver will be carried through with the iron solution and deposited in a spongy state in the vessel placed to catch it, but the greater portion of the crystalline sulphate of silver is converted into a dense coherent mass of metallic silver, which when washed and pressed is fit for the crucible.

MINING IN COLORADO.—The Krom Concentrator, which effects a separation of metallic and earthy substances in the dry way by means of air, is in operation at the Washington mill, Colorado, and Mr. William Bement, the superintendent, who has improved the machinery lately, has furnished to the Georgetown Mining Journal a lot of ore from the Terrible Lode, concentrated for Messrs. Crow and Clark, that show the practical results obtained from dry concentration:—“The amount of ore delivered at the Washington mill was 423 tons, which was dried, and it then weighed 407½ tons. Crushing, sampling, and assaying of this ore proved that it contained silver to the amount of \$24.22 cents per ton, thus making the total value of the ore \$22,094.55 cents. This ore was concentrated from 407½ tons into 178 tons, or very nearly 2.3 tons into one.”

The results from the concentrated ore were as follows:—
Cost of reduction and loss by amalgamation \$793.81
Cost of concentration and hauling ore to mill 6595.50
Loss on 22½ tons of tailings, at \$3.91 897.37
Cost of hauling concentrated ore to reduction works 178.00 = \$12,604.66
The value of the crude ore, as shown above, was \$22,094.55 cents; the expenses of treatment being \$12,604.66 cents; the net returns were \$9489.89 cents.

The miner comments on these results as follows:—“Now let us see what the net returns from this ore would have been had it not been first concentrated. The ore previous to concentration weighed 407½ tons, and contained \$22,094.55 cents in silver. The reduction works in Georgetown, at which this ore is treated, returns 80 per cent. of the value of the ore, at a cost of \$24 per ton. The returns from the treatment of the crude ore would have been as follows:—

Cost of reduction \$10,187.58
Loss by amalgamation 4,418.93
Hauling ore to mill, at \$3.91 per ton 1,269.00 = \$15,875.43

The value of the ore being \$22,094.55 cents, the net returns from this method of treatment would have been \$6219.22 cents. A comparison of the two methods of working shows that the above-mentioned 407½ tons of ore from the Terrible Lode yielded a net return of \$9489.89 cents when concentrated previous to being milled; and that the same weight of ore, if it had been treated without concentration, would have netted \$6219.22 cents, thus showing an actual and positive gain of \$3270.77 cents (\$8.02 cents per ton) by the use of concentrating machinery. The magnitude and character of this test of the practical workings of dry concentration is a positive proof of the value of the system in use at the Washington mill. The results obtained clearly show that there is merit in the Krom concentrator, and that very many of our ores can be more profitably worked than they now are by first concentrating them. Mr. Bement is engaged in concentrating Terrible ore for the Terrible Lode Mining Company and for the Clark Mining Company, and in the last 15 days has crushed and concentrated 180 tons. The mill is full of ore awaiting concentration.”

According to the Central City Register of May 31, Mr. Bement has also concentrated a lot of ore weighing 3500 lbs.—an average of a 4-ft. vein cut by the Monticello tunnel down to 210 lbs.—which assayed 112 ozs. per ton, the finest size assaying 228 ozs. per ton, while the dust assayed only 6 ozs. The company are now dressing 12 tons of ore daily, and on the average reduce it from five to one. This gives an actual cash value to much of the hitherto worthless ore.—*Engineering and Mining Journal.*

FOREIGN MINES.

PORT PHILLIP AND COLONIAL (Gold).—The directors have declared a distribution of 1s. per share, on account of the thirteenth dividend (being at the rate of 10 per cent. per annum), payable on July 1.

Statement of Operations, Oct. 13, 1870, to March 29, 1871.—The quantity of quartz crushed was 29,097 tons, and pyrites treated 288 tons. The total gold obtained was 8770 ozs. 10 dwts., or an average yield per ton of 6 dwts. 3 grs. Receipts, 33,000, 8s. 9d. Payments (including £245, spent on stock of timber and firewood, &c., for use of current and portion of next season), 26,550, 7s. 2d. Profit available (including £200, 1s. 9d. brought forward from October account) was 6707, 3s. 4d., and was divided as follows:—Port Phillip and Colonial Gold Mining Company (Limited), 3997, 10s.; Clunes Company, 2152, 10s.; and the balance of 670, 3s. 4d. has been carried to April account.

Financial Statement, June 30.—Balance of funds in favour of the company available for distribution, 4927, 4s. 8d. The distribution on account of thirteenth dividend of 1s. per share will absorb 4874s. There are no debts or liabilities. The Collins Street property, reported as sold in last report, realised net 3789, 16s. 8d., of which 3600s. has been carried to reserve fund, and the balance to the credit of revenue account. The reserve fund now amounts to 9031, 10s., and is represented by 8800, Victoria Government Five Per Cent. Bonds, the board, under the authority contained in the amended Deed, having altered the investment from New Three Per Cent.

SOUTH AURORA (Silver).—V. A. Benjamin, Hamilton, June 3: We had to stop the mill yesterday, as the tramway could not convey our ore, and our only supply of fuel had been used up. I shall continue hauling, and endeavour to get teams sufficient to haul the quantity of ore we require. Shall start up as soon as possible; hope it will not be later than the 15th inst. Amount of bullion shipped, \$35,972.90; 100; will forward statement about the 10th. No change in the mine to note.—The directors have received per steamer Duane 8 bars of silver from their mines, value 1943, 3s. 4d.

ECLIPSE (Gold).—The following is an extract from a letter received from Messrs. Balfour, Guthrie, and Co., the company's agents at San Francisco, under date June 7. At the request of Capt. Tregellas we send you the following telegram on June 5:—“The lode in the bottom level is worth \$113 per 2000 lbs., June 5, and hope the same would duly reach you.” Capt. Tregellas has, doubtless, written you in explanation. We may simply mention that the above is the result of assay of a small quantity of “small” ore sent up from the mine, gathered, as he explains, promiscuously from a heap of broken stuff lying in this level. The particulars of the assay are as follows:—4.96 ozs. gold, value \$102.53; 8.17 ozs. silver, \$10.56; total, \$113.09 per 2000 lbs.

GUERRERO (Gold).—Letters, dated May 29, just received per royal mail steamer, from Mr. Potts, the Guerrero Company's agent in Mexico, mention that samples of auriferous quartz, taken from the company's mine San Martin, had been assayed at the Mexican mint, and had yielded the extraordinary produce of 15 to 17 ozs. of gold to the ton of ore. The San Martin has been selected by the company as a representative, from its numerous quartz mines, for being worked at once on an extensive scale, and the above assays show that the selection has been a judicious one.

ANGLO-ITALIAN.—The directors have advised (June 23) from Mr. Wahl, the company's manager, confirming a telegram which was imperfectly rendered:—“Reached the Tonil lode yesterday, mineral presenting well and in abundance.” Mr. Wahl also writes that “its appearance is satisfactory, and according to measurement made at once we are at a distance of about 12 metres from the sink, so that we may now expect to find plenty of ore for our mills.”

UNITED MEXICAN.—Extracts of despatch from Mr. Edward Hay, dated Guanajuato, May 24:—“Mine of Jesus Maria y Jose. The extraction of ore in this mine has been less this month, owing to a small work we have had to undertake—opening a new roadway from Remedios to this mine, the old one being insecure. Although the quantity of ore remitted to the hacienda has consequently been smaller than in the previous month, our reducing establishments have not suffered any diminution in their productive powers, as fortunately the Mine of Remedios has given, and will give for some time, the necessary cargo to keep the hacienda on full work. The excess of outlay on returns in this mine for the month of April has amounted to \$1384.—Mine of Remedios: A slight improvement has taken place in the ley of the ore met with in San Crescencio north, and San Cristobal south. The accounts for the month of

April show a profit amounting to \$2277, of which sum \$1328 belong to the company.—New Concern: Adit of San Cayetano: The work which has been carried on in the Adit of San Cayetano has continued steadily, and in the month of April we have driven 3 varas further on in the mountain. In the three weeks of the present month of May we have advanced 5 varas, and there is no change in the appearance of the rock.—Mine of San Antonio de la Ovejera: In this mine in carrying on the cross-cut of San Fernando, during the four weeks of April we drove 6½ metres without any change in the general appearance of the rock. In the beginning of this month we cut a small relief of about an inch thick, running from east to west, through which the water oozed rather more freely than through the former ones we have traversed. The rock subsequently became hard again and very solid. We have driven in the three weeks ending 20th May 5¼ metres; the total distance from the shaft measuring 73½ metres.

BATTLE MOUNTAIN.—Captain Richards, June 8: Virginia. In the 37 feet level north the lode is improving in character, now producing occasional fine stones of ore; this drive is being pushed forward with a view of getting ventilation from it for the 73 below, and it looks also promising for a course of ore when a little further advanced. In the 73 feet level north we have been rising, with a view of obtaining the needed ventilation more speedily, and so far as we have gone up (about 6 feet) the lode is holding on, producing some splendid ore, and it looks as if it would continue; if so, the 37 will soon meet with it in its onward course. In the slope in the back of the 73 feet level the lode is large, and producing a quantity of ore. In the back of the 113 feet level the lode is most important. It is to be hoped that the men being engaged foring on the other points. Ore raised during the week, 140 sacks.

COLORADO UNITED (Gold and Silver).—A competent agent, selected by the directors, sailed on Saturday, in the Scotia, with instructions to examine into the title to the mine, to check the amount of ore which is now represented to be in sight, and to otherwise verify the statements made in the prospectus, before completing the purchase—at the suggestion of the vendors.

PACIFIC.—Lander Hill, June 8: The ground is changed for the better in the rise at the 550 ft. level. The north cross-cut, at the 400 ft. level, is letting out a quantity of water. No alteration in the south cross-cut at the 400 ft. level. Nos. 1, 4, and 5 slopes are producing rich ore. No. 3 slope is looking well. No. 2 slope is rather poor. No. 6 slope will be started to-morrow. The United shaft is producing a small quantity of very rich ore. Chloride shaft paid \$30 profit in one week; worked by one man; it is now idle.

[For remainder of Foreign Mines see to-day's Journal.]

[ADVERTISEMENTS.]

From Mr. JAMES CROFTS:—The Mining Market during the past month has been well supported, for not only have advances taken place in tin, but copper, which for so long a period has been at such depressing quotations, has suddenly taken a turn, and a substantial advance established. This will have a marked effect upon many struggling copper mines, turning money loss into small profits, whilst to large mines, like the DEVON GRANGE, in Devon, and SOUTH CARADOCY, the advance is most important. It is to be hoped that the rise will be maintained, that the “worst” of the copper market has at least been seen, and that the proverbial mending of affairs has set in. The causes of the satisfactory condition of the tin market can easily be deduced, for the restored activity upon the Continent is sufficient to cause even higher prices, whilst the consumption in all countries is continually upon the increase. Altogether the miner in “the county” has good cause to congratulate himself upon his prospects, and there is every probability of the last six months of the year showing a good increase of business upon the district.

The marked success that has attended several of the lead mines lately introduced to the public has occasioned a general demand for shares in sound lead-producing mines.—Indeed, at no time were the public more disposed to invest in properties possessing well-defined lodes, and from which reasonable chances of success can be shown. The WILLOUGHBY LEAD MINE is situated in Carnarvonshire, and has been formed into a limited liability company of 12,000 shares, with 21. 10s. per share, fully paid. The mine was purchased by one of the largest shareholders in Tankerville, and has been most favourably reported upon by several mining agents of repute, amongst whom may be mentioned Capt. A. Waters, of Tankerville, and Capt. Rowe, of Great Lacey. A lode has been discovered within 5 or 6 fms. from the surface, worth from 2 to 3 tons of lead per fathom. Capt. Waters has stated that he never saw a lead lode show better so near the surface, and added to this, it may be remarked, that the lodes are not situated in quartz or sandstone, like most of the Carnarvonshire mines, but in clay-slate—a most favourable formation for making rich deposits of lead. The sett, which is ample (half-a-mile long by half-a-mile wide) contains sufficient water-power for all the requirements of a large mine, and it is estimated that the lode when laid open by levels and drains will yield lead at a cost of about 20s. per ton. The machinery required to develop the mine is now in course of delivery, and it is expected that within three months the property will be in full working order. The capital (£30,000) has been already subscribed, therefore no prospectus will be issued. The shares are likely to attain a good premium in a short time, and the writer can thoroughly recommend them to his friends and the public, as offering an opportunity of investing in a sound and legitimate undertaking, possessing such prospects of early success as are very seldom met with. The writer is able to guarantee a certain number of shares to his friends at par (21. 10s.), but would recommend immediate applications, as it is not likely that they will be obtainable at this price for long.

From Mr. GEORGE BUDGE:—To judge from the numerous mines lately introduced, and the high premiums attained, mining is becoming an attractive speculation, and receiving a large amount of support. This, in some measure, may be accounted for by some recent splendid discoveries, and, no doubt, many more will follow, as an unusual amount of capital is being subscribed for their development. Many people are struck with the great disparity in the prices of shares in various mines when comparing their respective merits. Highly remunerative investments have been overlooked, owing to their not having been brought prominently forward. It is a well-known fact that the majority of shares in half the dividend mines have been held principally by original holders, and that the public do not invest until the shares reach a high price.

One of the best progressive mines at the present time, and one that deserves the special notice of investors, is the BWADRAIN CONSOLS LEAD MINE. The mine is rapidly improving in depth, the returns are regular, and a very little more capital will make it one of the most profitable mines in Cardiganshire. These shares are surprisingly cheap, and will ultimately attain a high price. Those who embrace the present favourable opportunity in buying will, undoubtedly, make a good investment. The mine presents such splendid prospects that success is almost a certainty. As I predicted some time since, good results have followed the operations in the 45s. The lode at the present time is worth about 2 tons per fathom, in whole ground to surface, improving, and spreading in depth. The operations in the 55s are a very important feature, and are being rapidly extended for the purpose of cutting the ore going down in the 45s. This being accomplished, the mine will compare most favourably with others the shares of which are selling at ten times the present price of Bwadrain. The improvement is more noticeable from the fact that the mine is situated in the richest district in Cardiganshire, and in the same channel of ground, embracing many of the richest mines in Wales.

CAMBORNE, June 29.—There has been a good demand for all mining shares, at advanced prices. Those principally dealt in have been Carn Brea, Tincoff, Cook's Kitchen, North Crofty, South Crofty, Emily Henrietta, Wheal Agar, North Roskear, Carn Camborne, East Pool, South Condorow, Trumpet Consols, Great Wheal Vor, West Frances, Wheal Ury, and Wheal Margaret. Carn Brea shares have fluctuated a great deal, but appear steady now, at 130s.; buyers; this is a good investment at the present price, as before many months are over they will be 200s. per share, and cheap at this. Tincoff, 52½ to 53, firm; Cook's Kitchen, 28 to 28½; Carn Camborne, 3½ to 4, with a demand, owing to the improved prospects of the mine; North Crofty, 24 to 25, firm; at the meeting of shareholders, to be held in London to-morrow, a dividend of 1s. per share will be declared. South Crofty, 16 to 16½, with an enquiry. Emily Henrietta, 21 to 23, with a good demand, owing to an improvement in the shaft for copper, and from its general appearance it is thought they will have a very rich lode. Wheal Agar, 20s. to 25s. North Roskear, 15½ to 16, with an enquiry; this mine appears to be gradually improving, and is very nearly able to pay cost; a call of 20s. per share was made this week, and it is supposed this will be the last. East Pool, 13 to 13½; South Condorow, 5¼ to 5½, firm. Trumpet Consols, 27 to 27½; at their meeting, to-morrow, an increased dividend is expected. Great Wheal Vor, 10½ to 11, and very firm; this mine is looking well throughout. West Frances, 4 to 4½, firm; Wheal Ury, 8 to 8½, quiet; Wheal Margaret, 15½ to 16; this is a cheap share to buy at the present price. Metals are very firm, and we shall have much better prices.

CAMBORNE VEAN.—In this mine which, owing to its fortunate position relatively to Dolcoath, is dry to a depth of 180 fms., very valuable discoveries of ore are being made on the lodes which are giving such enormous profits in the three adjoining mines on the east, Dolcoath, Cook's Kitchen, and Tincoff. There can scarcely be a doubt but that Camborne Vean will prove equally productive, and will probably yield in a few days to be brought into production by means of a limited liability company.

HINGTON DOWN CONSOLS.—Saving a temporary falling off in the 110 fm. level west the prospects of the concern are brighter. The winze going down below the 110 fm. level is in a magnificent course of ore, and as the 120 end is being pushed on as fast as possible it is confidently expected that the lode in that level will be met with much earlier than in the two levels above. Their sale of ore for the last two months will realise over 1000s., leaving a handsome profit to the shareholders.

GORSEDD AND CELYN LEVEL.—The success that has attended this company since its formation must afford satisfaction to the holders of shares. The produce from the sumps below the adit level is increasing. The Merilyn vein, that yielded in the adjoining mine lead ore to the value of 50,000s., is now through the sett for the whole length in virgin ground; the intersection of this lode may be looked for with great interest. The shareholders possess a property of undoubted wealth.

FRANK MILLS.—With the improvements that are taking place in the deeper levels in this mine, and the sound state of its finances, it is difficult to understand the present depreciation in the market value of shares. At the next meeting it is expected a dividend will be declared. At present prices the mine is selling for (say) 6000s., having a cash reserve fund of over 1500s.

FURZE HILL (Tin).—Great energy is being displayed by the managing director, Mr. Betteley, in pushing on the works. A powerful water-wheel and sufficient pit-work have been purchased, and we are looking forward with much interest to the mine being in work, feeling convinced that profitable returns of tin will be made as on after the mine is drained and the stamps are erected. A large proportion of this valuable property is held by local shareholders, thus showing their confidence in the undertaking.

CANYON.—As will be seen by the sale of ore on June 20 (a parcel of lead 40 tons, and blende 70 tons, realising together nearly 800s.), the ore put in the market peaks for itself. There are still one or two very important points to come off soon, which may open out a rich mine at any day; and it is confidently expected that this mine will not only pay costs, but be making profits before the close of the present year. There are many other mines in Wales, if the right man were in the right place, would follow in the same wake.

HINGTON DOWN CONSOLS.—There is little doubt but this mine will shortly be one of the best in Cornwall. The western end has recently im-

proved; and in the bottom of the winze sinking from the same level (the 110) a splendid course of ore is opening up. It is fully believed that this mine will soon resume its old place in the Dividend List. More than half the shares are held in the neighbourhood of the mine.

SOUTH CONDOROW.—It seems strange that a mine in the Camborne district, in which splendid discoveries of tin are being made, should not attract more attention than this one does. There cannot be much doubt with practical miners that it will soon equal the best mines of the same district in the production of tin and profits. The great size of the lode ensures the permanency of the mine, and the shallow levels at which the tin is being discovered will allow of the largest rate of profits being realised from the quantities of the lode. In the 51 fm. level, where the lode has only recently been cut into, it is found to be 18 ft. wide, and worth 150s. per fathom for that width.

“TECHNOLOGICAL DICTIONARY.”

For nearly twenty years it has been customary with those engaged in industrial pursuits involving the necessity of knowing the progress making in France and Germany to refer, in all cases of difficulty with regard to the exact translation of a technical expression, to Bells “Technological Dictionary,” and, although several competitors have from time to time made their appearance, not one of them have approached it either in accuracy or completeness. At present the extension of technical education, and the desirability of the industrial of each country knowing what is being done abroad, in order to be enabled to suit the markets which it is intended to supply, the use of such works becomes more appreciated. The progress made, the increased intercommunication, and the interchange of processes have all tended to make the technical language of a country widely different to that which existed when the dictionary was first issued; it will, therefore, be especially gratifying to the manufacturers and inventors of all the three nationalities to learn that the new edition of this standard dictionary, thoroughly revised and considerably enlarged, has just been completed, and now forms one of the most useful books of reference for the translator and man of business that could reasonably be desired.

From the manner in which the editorship of the “Technological Dictionary” has been conducted the accuracy that has been attained is scarcely surprising.—The revision of the dictionary as far as regards each particular class of technicality has been entrusted to some gentleman whose special pursuits are calculated to make him acquainted with the precise shades of meaning attached to words usually considered as almost synonymous—thus, Dr. Mothes, whose profession (that of an architect) has necessarily made him acquainted with every important detail connected with architecture, has himself undertaken the revision of the technicalities relating to monumental, civil, and hydraulic architecture, carpentry, masonry, ornamentation, sculpture, and building materials, as well as those relating to roads, bridges, and waterworks; whilst Mining Councilor Althaus, of the Royal Schönebecker Saltworks, has taken mining, saltworks, and tunnelling; Mr. L. Bach, engineer, of Linden, near Hannover, machinery and steam-engines; Prof. Sandberger and Leonhard, mineralogy and geology; and Prof. H. Wedding, whose name is already well known to the readers of the *Mining Journal*, has undertaken the metallurgy, smelting, extraction, and preparation of metals, and metal casting. Although the full value of a dictionary can only be completely ascertained by long use, it may safely be said that a careful and promiscuous examination of it shows that reliance may be placed upon it, the few inaccuracies we have been able to discover being quite unimportant, such as “Latin brass” for “laten brass,” and so on; and even this is corrected in many parts of the dictionary, though many English workmen would probably be unable to determine which is the correct orthography. The dictionary complete will be a great acquisition in any scientific library, and, being bound in three volumes, is very convenient for reference, which would not be the case were the whole 2000 pages bound together.

“Technological Dictionary,” English, German, and French. By Dr. OSCAR MOTHE, assisted by Numerous Collaborators. London: Trübner and Co. Paternoster-row.

FATAL BOILER EXPLOSIONS.—An adjourned inquest was held on Monday at Wellingborough, to enquire into the death of Benjamin Tomkins, a labourer, employed at Messrs. Butlin and Co.'s iron furnace at that place. The evidence given at the first enquiry went to show that there were at the works four large Cornish boilers, set in masonry, and that on Saturday morning, June 17, all of them were at work. About 8 o'clock one of the boilers exploded with a loud report, causing the death of one man and injury to two others. The boiler was propelled a distance of 195 ft., and was only brought to a standstill by first coming in contact with a traction engine, and then with a 14-in. wall, in which it made a large breach. The unfortunate man who was killed was frightfully mutilated, and died almost instantly; he was struck by the boiler as it was passing through the air. A man named William Spence and a lad, who were in charge of the traction engine, were scalded, the former very severely. The boiler, which had been inspected by Mr. Jonas Brown, the foreman at the works, only a few minutes before the explosion, and considered by him to be in a perfectly satisfactory condition, had been in constant use for about five or six months (allowing for cleaning), and was nearly new when it was purchased about that time. It was 28 feet long and 6 feet in diameter; the plates were ¾ in. thick, but the plates of the tube were only 1-16ths in. thick, and it was worked at a pressure of 35 lbs. to the square inch, and the witness Brown considered it was fit for working up to from 35 lbs. to 45 lbs. When purchased it was tested by hydraulic power to 78 lbs. per square inch, and the boiler appeared to stand the test satisfactorily. There were 5 in. of water in the gauge just before the explosion. Mr. George Blackwell, from the firm of Messrs. Alchin and Son, engineers, of Northampton, who examined the boiler after the accident, attributed the explosion to over-pressure, and stated his belief that the boiler ought not to have been worked with more pressure than 20 lbs. or 25 lbs. to the square inch. He added that if all the plates had been ¾ in. in thickness, and the iron good, it might have been worked to 30 lbs. He considered, however, that the iron was of inferior quality. At this point, after hearing the medical evidence as to the cause of the death of the deceased man, the inquest was adjourned for scientific testimony, and it was agreed that Mr. L. E. Fletcher, chief engineer of the Manchester Steam Users' Association, should be called in. This gentleman's assistant, having inspected the boiler, gave it as his opinion that the cause of the explosion was the weakness of the internal tube, which had not been strengthened by flanges or some of the approved systems of bolting. The witness then made a verdict that the deceased died from the effects consequent on the collapse of the boiler tube, but that, while there was nothing to show culpable negligence on the part of the owners, there appeared to have been insufficient precaution at the time of purchase of the boiler; the scientific evidence, too, pointed to the fact that the boiler was not up to its work.

A fatal explosion occurred at Brindley Ford, North Staffordshire, on Wednesday evening. About 7 o'clock, as the day-men employed at Messrs. Robert Heath and Son's Black Bull Ironworks, were leaving their work, to give place to the night-men, a boiler, 20 ft. long, exploded, and killed six men, seriously injuring 20 others. The ends of the boiler were carried, by the force of the explosion, to a distance of 160 yards, and the main body of the boiler was blown a considerable distance. A great amount of damage was done to the works. Several of the injured men are expected to die.

STEAM BOILERS.—The invention of Mr. J. S. CROSLAND, of Manchester, consists in a combination of two or more cylindrical boilers placed one over the other, and connected by conical water-tubes, the fire being placed under the upper boilers, and the feed water entering in at the lower boiler, and to a combination of a cylindrical boiler and descending conical water tubes, the lower ends of which are connected together by a pipe through which the feed water enters; also in combining central tubes with such conical, connecting, or descending tubes to form a partition between the ascending and descending currents, and thereby causing a more perfect circulation of the fluids.

COPPER ORES.

Sampled June 7, and sold at Swansea, June 27.

Mines.	Tons.	Produce.	Price.	Mines.	Tons.	Produce.	Price.
Cape.....	45	35	£23 14 6	Berehaven.....	75	7½	£24 17 6
ditto.....	44	35	23 16 0	Knockmahon 90	8	8	0 0
ditto.....	44	35	23 16 0	ditto.....	119	8	4 15 6
ditto.....	50	31½	21 16 0	ditto.....	84	4	2 2 0
ditto.....	50	27½	18 19 0	Paramatta.....	65	16½	10 18 0
ditto.....	50	27½	18 19 0	ditto.....	63	16½	10 18 0
ditto.....	11	34½	23 6 0	ditto.....	46	16½	10 18 0
ditto.....	50	34½	23 16 0	ditto.....	45	16½	10 18 0
ditto.....	49	34½	23 16 0	Copper Ore.....	14	21½	10 11 0
ditto.....	38	34½	23 16 0	ditto.....	16	16½	10 11 0
ditto.....	51	34	18 10 0	ditto.....	23	16½	10 11 0
ditto.....	21	39½	26 19 0	Copper Reg. 24	11½	7	8 0 0
ditto.....	5	53½	36 2 0	Michell's Ore 63	3½	2 18 0	
Berehaven.....	80	7½	5 1 0	Copper Reg. 27	14	7	8 10 0
ditto.....	79	7½	5 1 0	ditto.....	6	29½	19 3 0
ditto.....	120	8½	5 11 0	Knockmahon 129	10½	6 18 0	
ditto.....	71	7½	4 15 0	ditto.....	23	8½	5 6 0

TOTAL PRODUCE.

Cape.....	574	£12,829 1 0	Copper Regulus.....	24	£4 4 0
Berehaven.....	425	2,169 19 0	Michell's Ore 90	63	258 11 6
Knockmahon.....	387	1,680 18 0	Copper Regulus.....	33	344 8 0
Paramatta.....	219	2,685 3 0	Knockmahon 129	23	1553 12 6
Copper Ore.....	62	23 1 0			

COMPANIES BY WHOM THE ORES WERE PURCHASED.

Names.	Tons.	Amount.
Copper Miners' Company.....	16	£47 4 0
P. Grenfell and Sons.....	322½	2585 11 6
Sims, Williams, and Co.....	112	697 9 0
Vivian and Sons.....	378	2863 11 0
Williams, Foster, and Co.....	633	6646 19 0
Mason and Elkington.....	187½	8200 17 6
Charles Lambert.....	207	2385 1 6
Sweetland, Tuttle, and Co.....	184	2688 9 0

Total..... 2040 £21,993 3 0

NO SALE on July 18.

NO SALE on July 18.					TOTALS AND AVERAGES.				
21 cwt.		Produce.	Price.	Per unit.	Standard.				
Wholesale.. 2040		16	£10 15 6	13s.4d....	£ 89 8				